THE OFFICE ACTION

In the Office Action issued on December 28, 2004, the Examiner rejected claims 3 and 7 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter. The Examiner rejected claims 1-4 and 7 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,995,173 to Barberi et al. ("Barberi") in view of U.S. Patent No. 5,434,685 to Pirs et al. ("Pirs"). Finally, the Examiner further rejected claims 5 and 6 under 35 U.S.C. §103(a) as being unpatentable over Barberi in view of Pirs and further in view of U.S. Patent No. 4,590,146 to Wallbillich ("Wallbillich").

In an advisory action mailed April 7, 2005, the Examiner indicated that she would not review supporting documents provided by the Applicant because such a review would require a further search and consideration of the subject matter.

REMARKS

Applicants have carefully considered the Office Action issued on December 28, 2004 as well as the Advisory Action issued April 7, 2005. Applicants respectfully request reconsideration of the application in light of the above amendments and the following comments.

A. The Pending Claims Comply with 35 U.S.C. §112

In the final office action, the Examiner rejected claims 3 and 7 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter. Specifically, the Examiner objected to the use of the term "structure factor". The Examiner believed that by not defining the term in the specification, the meaning of the term was not clear and amenable to multiple meanings.

In making this rejection, the Examiner stated that "upon review of the art of liquid crystals, it appears to the Examiner that 'structure factor' may have multiple possible meanings...Because there is no clear definition in the art as to what a structure factor is, it is not currently possible to determine what Applicant means by 'structure factor'. Accordingly, the claims are rendered indefinite."

Applicants were somewhat at a loss as to how to respond to this rejection,

as the term "structure factor" has a defined meaning in the field of diffraction gratings. The Examiner stated that upon the Applicants' urging, she searched "the entire Patent Office data base (including all arts) finding only one reference about 'structure factor'". In an effort to assist the Examiner in her understanding, Applicants submitted several references describing the meaning of the term "structure factor" in the after final response filed on March 22, 2005. These references included a definition for the term "structure factor" in the *McGraw-Hill Dictionary of Scientific and Technical Terms* as well as a representative discussion of "structure factor" in the specific context of x-ray diffraction for a crystal from an internet web page (http://www.gly.uga.edu/schroeder/geol6550/CM05.html).

In the advisory action, the Examiner indicated that to properly review these submissions, further searching and consideration was required. Thus, Applicants have filed the present RCE and again resubmit these references as Appendices A and B. The Examiner will see that, although best expressed in mathematical terms, the structure factor is essentially the sum of the amplitudes of scattered radiation from a diffracting material. Applicants suggest the Examiner review these submissions to familiarize herself with the meaning of this term, as it presents an additional point of patentability for the present invention. Applicants would also like to point out that these references are provided merely as exemplary references to point out the accepted use and standardized definition of this term in the field of diffraction gratings. Applicants strongly urge the Examiner to perform her own additional searching to familiarize herself with this term and its meaning in this context. Applicants request withdrawal of this rejection based on the standardized definition for this term in the field of diffraction gratings.

C. The Pending Claims Are Patentable Over Barberi in View of Pirs

The Examiner rejected claims 1-4 and 7 under 35 U.S.C. §103(a) as being unpatentable over Barberi in view of Pirs. Applicants respectfully traverse.

Barberi is directed to a display device based on nematic liquid crystals with positive dielectric anisotropy between two transparent plates, at least one of which defines a quasi-bistable anchoring. By applying a temporary electric field to the cell, the anchoring is broken, allowing localized orientations of the liquid crystal

molecules corresponding to the preferred orientation of the quasi-bistable anchoring. Switching is effected between an ordered hybrid texture and a disordered state, which is stabilized by the quasi-bistable anchoring. Using two crossed polarizers, this configuration allows for the non-transmission of light when the hybrid state is present while when an array of defects is present, light is transmitted (col. 3, lines 10-20). Nowhere does Barberi disclose or suggest the presence or use of a diffraction grating as disclosed and claimed in the present application.

Pirs is directed to a ferroelectric liquid crystal cell for use in display devices and optical switching devices (col. 1, lines 8-12 and col. 7, lines 45-48). Pirs is specifically directed to cells utilizing ferroelectric liquid crystals, which have advantages over cells employing nematic liquid crystals (such as in Barberi) in such applications (col. 1, lines 15-26). Pirs discloses the use of polymerizable microdroplets or globules randomly interspersed in the liquid crystal. The monomer droplets are polymerized to three dimensional structures, disposed predominantly on the cell walls. Pirs notes that the resulting cell is characterized by high transparency, and clear contrast (col. 7, lines 57-59). As with Barberi, Pirs fails to disclose or suggest the presence or use of a diffraction grating as disclosed and claimed in the present invention. A proposed combination of Barberi and Pirs fails to suggest the present invention for at least the following reasons.

First, there is no motivation to combine Barberi with Pirs. Here, there is no motivation to combine the teachings of the references since they actually teach away from such a combination and, in fact, present incompatible technologies.

In this respect, prior art references must be considered in their entirety, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 220 USPQ 303 (Fed. Cir. 1985). Here, the formation of "convective cells" as described in Barberi are due to the charging of the nematic liquid crystal by an externally applied electric field, which in turn induces convective fluid movement and resulting hydrodynamic moments on the nematic surface directors.

Pirs, on the other hand, utilizes polymer droplets or globules to freeze the arrangement of the liquid crystal, preventing the flow of liquid crystal and locking in the molecular ordering of the liquid crystals (col. 2, lines 29-36). As described

above, this provides superior performance in the polymer stabilized displays of Pirs due, in part, to their structural bistability and resistance to mechanical disturbances. One practicing the invention of Barberi would not be motivated to combine the teachings therewith with those of Pirs, or vice versa.

Applicants are at a loss as to what type of combination of Barberi and Pirs the Examiner is contemplating. Combining the teachings of the two references would not even be considered by one skilled in the art due to the inherent incompatibility of the two references. The use of a polymer network of various structural morphologies as taught by Pirs in the invention of Barberi would prevent or at least severely impede the creation of surface defects due to the Felici effect as taught by Barberi. That is, the use of a polymer network would actually work against the invention of Barberi as it would hinder the hydrodynamic instabilities and localized orientations required for the proper functioning thereof due to the volume and flow stabilization afforded by the polymer.

The Examiner will appreciate that such a combination would prevent Barberi from functioning as described. The "freezing" of the liquid crystal orientation of Pirs and locking in of the molecular order would prevent the invention of Barberi from functioning, as Barberi requires the hydrodynamic movement of the nematic surface directors. In the plainest of terms, Barberi requires the movement and reorientation of liquid crystal molecules in his cell, whereas Pirs describes a polymer network that essentially freezes the location and movement of the liquid crystal. Such a combination would be incompatible.

Here the Examiner has clearly found references allegedly disclosing the elements of the present invention, and proposed a combination based on these references even though they provide no suggestion for such a combination, and indeed could most likely not be combined. This is a classic example of impermissible hindsight reconstruction.

In attempting to provide support for the proposed combination, the Examiner states, "it would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Barberi in view of Pirs so that the properties of the liquid crystal cell can be maintained, susceptibility to shock is reduced, the distance between the cell walls is maintained, and the flow of liquid crystals within the cell is prevented." (Office Action, page 5).

Where is the Examiner getting the concept that Barberi desires to prevent the flow of liquid crystal within the cell? In fact, Applicants submit that it is the very

mobility of the liquid crystal in Barberi that allows for the breaking of the plate anchoring and the reorientation of the liquid crystal molecules. That is, as discussed above, it is the movement of the liquid crystal molecules that produces the hydrodynamic instabilities and allows for the breaking of the surface alignment of the plate. The use of a polymer network would hinder such movement. Thus, there is absolutely no motivation to combine the teachings of Barberi and Pirs.

Second, even if the references could somehow be combined, they would still not render the present claims obvious under §103.

Here, neither Barberi nor Pirs is within the present field of endeavor nor are they reasonably pertinent to the particular problem addressed by the present invention. In this respect, neither Barberi nor Pirs is directed to the field of diffraction gratings. That is, Barberi and Pirs are both directed to liquid crystal cells for display devices. As detailed above, these references are simply not pertinent to the particular problem with which the present invention is concerned. Thus, even assuming for purposes of argument that all of the limitations of the present claims can be found by culling from the prior art parameters to fit the claimed invention, it is improper to pick and choose individual elements from assorted prior art references to recreate the claimed invention without some motivation to do so. *Symbol Technologies, Inc. v. Opticon, Inc.*, 19 USPQ2d 1241 (Fed. Cir. 1991).

With further respect to claim 2, such a proposed combination does not disclose or suggest wherein the convective rolls are arranged with a grating spacing approximately twice the separation distance between the cell walls.

With regard to claims 3 and 7, the proposed combination inherently does not disclose a structure factor or its adjustment, which is a diffraction grating property, since the proposed combination does not disclose or suggest a diffraction grating. The Examiner's assertion that the "coils of liquid crystal are arranged with a structure factor and that the structure factor (meaning possibly the shape of the coils, thermal-mechanical factors of the coils, etc.) is adjusted because of the electrical supply means" is completely insufficient to present a prima facie case of obvious, especially since the Examiner has assumed a completely incorrect interpretation of the term "structure factor". Applicants are confident that as the Examiner becomes familiar with the meaning of structure

factors, she will realize this point. With regard to claims 4-7, the proposed combination does not disclose a polymer network bounded by the convective roll structure.

In the Advisory Action, the Examiner states that "Applicant claims that the polymeric network is stabilized and frozen in after formation of the polymeric network...Thus, the Examiner believes that the rejections of record in light of the applied prior art are appropriate." But as detailed above, however, the "freezing" of the liquid crystal orientation of Pirs and locking in of the molecular order would prevent the invention of Barberi from functioning, as Barberi requires the hydrodynamic movement of the nematic surface directors. These two references include incompatible technologies, as Barberi requires the movement and reorientation of liquid crystal molecules in his cell, whereas Pirs describes a polymer network that essentially freezes the location and movement of the liquid crystal. Thus, the Examiner's reasoning is faulty.

For at least these reasons, Applicants submit that the proposed combination of Barberi and Pirs is inappropriate and fails to render the present claims unpatentable.

D. The Pending Claims Are Patentable Over Barberi in View of Pirs and Further in View of Wallbillich

The Examiner rejected claims 5 and 6 under 35 U.S.C. §103(a) as being unpatentable over Barberi in view of Pirs and further in view of Wallbillich. Applicants respectfully traverse.

First, there is no motivation to combine the teachings of Wallbillich with Barberi or Pirs. Wallbillich is directed to the addition of a compound to stabilize a photopolymerizable mixture and prevent it from spontaneously polymerizing. Barberi and Pirs are directed to liquid crystal cells for use in displays as discussed above. Wallbillich relates to completely different subject matter than Barberi and Pirs. One skilled in the art of liquid crystal cells for use in displays would not be motivated to combine the teachings of Barberi or Pirs with Wallbillich.

In support of the rejection, the Examiner stated "it would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Barberi in view of Wallbillich to prevent spontaneous thermal

polymerization." This conclusion is incorrect for several reasons. The problem of spontaneous thermal polymerization is limited to water-soluble or water dispersible mixtures, consisting essentially of a base polymer, a polymerizable ethylenically unsaturated compound, and an initiator, as detailed in Wallbillich (col. 1, lines 5-10). Barberi does not contain ANY polymerizable material and therefore the proposed combination is simply meaningless. Pirs only discloses polymerizable monomers such as acrylates and the like. It does not disclose the mixtures of Wallbillich. Therefore, there is no need to stabilize the monomers of Pirs as detailed by the procedure of Wallbillich. Thus, there is no motivation to combine Wallbillich with either Pirs or Barberi. The Examiner completely failed to address this argument submitted in the prior response so the Applicants reiterate their position here.

Even if the references could be combined, they would still not disclose or suggest all the elements of the present claims. The Examiner appears to be confused in her understanding of the present claims. Claim 5 depends on claim 4 and recites that the polymerizable mixture contains an initiator that is activated during the step of stabilizing the convective roll structures by forming a polymer network. The polymerizable mixture itself is not stabilized (as in Wallbillich). Rather, it is the convective rolls that are stabilized by the formation of a polymer network. Claim 6 merely recites wherein the initiator is a photoinitiator and the initiation of polymerization is photoinitiation. Again, however, the polymerizable mixture is not stabilized, only the convective rolls are. For at least these reasons, the proposed combination fails to render the present claims obvious.

CONCLUSION

In view of the foregoing comments, Applicants submit that claims 1-7 are in condition for allowance. Applicants respectfully request early notification of such allowance. Should any issues remain unresolved, the Examiner is encouraged to contact the undersigned to attempt to resolve any such issues.

If any fee is due in conjunction with the filing of this response, Applicants authorize deduction of that fee from Deposit Account 06-0308.

Respectfully submitted,

**FAY, SHARPE, FAGAN,
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Attachments: Appendices A and B

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APPENDIX A

McGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS

Sixth Edition

McGraw-Hill

New York Chicago San Francisco
Lisbon London Madrid Mexico City
Milan New Delhi San Juan Seoul Singapore Sydney Toronto

rock mass or rock unit, best seen in an outcrop. [SCI TECH] The arrangement and interrelation of the parts of an object. { 'strək·chər }

structure amplitude [SOLID STATE] The absolute value of a structure factor. { 'strək·chər ,am·plə,tüd }

structure cell *See* unit cell. { 'strək·chər ,sel }

structure constants [MATH] A set of numbers that serve as coefficients in expressing the commutators of the elements of a Lie algebra. { 'strək·chər ,kän·stəns }

structure contour [GEOL] A contour that portrays a structural surface, such as a fault. Also known as subsurface contour. { 'strək·chər ,kän,tür }

structure-contour map [GEOL] A map that uses structure contour lines to portray subsurface configuration. Also known as structure map. { 'strək·chər ¦kän,tür ,map }

structured analysis [SYS ENG] A method of breaking a large problem or process into smaller components to aid in understanding, and then identifying the components and their interrelationships and reassembling them. { 'strək·chərd ə'nal·ə·səs }

structured data type [COMPUT SCI] The manner in which a collection of data items, which may have the same or different scalar data types, is represented in a computer program. { 'strək·chərd 'dad·ə ,tīp }

structured food *See* food analog. { 'strək·chərd 'füd }

structured grid [MATH] In the discretization of partial differential equations, an organized set of points formed by the intersections of the lines of a boundary-conforming curvilinear coordinate system, at which the equations are expressed in discrete form. { ¦strək·chərd 'grid }

structured light [OPTICS] Light that is projected in a particular geometrical pattern that is used to aid in computer vision. { 'strək·chərd 'līt }

structured programming [COMPUT SCI] The use of program design and documentation techniques that impose a uniform structure on all computer programs. { 'strək·chərd 'prō,gram·iŋ }

Structured Query Language [COMPUT SCI] The standard language for accessing relational databases. Abbreviated SQL. { ,strək·chərd 'kwir·ē ,laŋ·gwij }

structured variable *See* record variable. { 'strək·chərd 'ver·ē·ə·bəl }

structured walkthrough [COMPUT SCI] A formal method of debugging a computer system or program, involving a systematic review to search for errors and inefficiencies. { 'strək·chərd 'wȯk,thrü }

structure factor [SOLID STATE] A factor which determines the amplitude of the beam reflected from a given atomic plane in the diffraction of an x-ray beam by a crystal, and is equal to the sum of the atomic scattering factors of the atoms in a unit cell, each multiplied by an appropriate phase factor. { 'strək·chər ,fak·tər }

structure map *See* structure-contour map. { 'strək·chər ,map }

structure number [DES ENG] A number, generally from 0 to 15, indicating the spacing of abrasive grains in a grinding wheel relative to their grit size. { 'strək·chər ,nəm·bər }

structure resonance [SPECT] An extremely narrow resonance exhibited by a small aerosol particle at a natural electromagnetic frequency at which the dielectric sphere oscillates, observed in the particle's scattered light excitation spectrum. { 'strək·chər ,rez·ən·əns }

structure resonance modulation spectroscopy [SPECT] The infrared modulation of visible scattered light near a structure resonance to determine the absorption spectrum of an aerosol particle. Abbreviated SRMS. { 'strək·chər ,rez·ən·əns ,mäj·ə'lā·shən spek'träs·kə·pē }

structure section [GEOL] A vertical section showing the observed or inferred geologic structure on a vertical surface or plane. { 'strək·chər ,sek·shən }

structure-sensitive property [SOLID STATE] A property of a substance that depends on impurities and the imperfections of the crystal structure. { ¦strək·chər ¦sen·sə·tiv 'präp·ərd·ē }

structure type [CRYSTAL] The structural arrangement of a crystal, regardless of the atomic elements present; it corresponds to the crystal's space group. { 'strək·chər ,tīp }

strut [AERO ENG] A bar supporting the wing or landing gear of an airplane. [CIV ENG] A long structural member of timber or metal, or a bar designed to resist pressure in the direction of its length. [ENG] **1.** A brace or supporting piece. **2.** A diagonal brace between two legs of a drill tripod or derrick. [MIN ENG] A vertical-compression member in a structure or in an underground timber set. [NAV ARCH] A bracket outside the hull of a ship, supporting the propeller shaft. Also known as propeller strut. { strət }

Struthionidae [VERT ZOO] The single family of the avian order Struthioniformes. { ,strü·thē'än·ə,dē }

Struthioniformes [VERT ZOO] A monofamilial order of ratite birds containing the single living species of ostrich (*Struthio camelus*). { ,strü·thē,än·ə'fȯr,mēz }

struvite [MINERAL] $Mg(NH_4)PO_4 \cdot 6H_2O$ A colorless to yellow or pale-brown mineral consisting of a hydrous ammonium magnesium phosphate, and occurring in orthorhombic crystals; hardness is 2 on Mohs scale, and specific gravity is 1.7. { 'strü,vīt }

strychnine [ORG CHEM] $C_{21}H_{22}O_2N_2$ An alkaloid obtained primarily from the plant nux vomica, formerly used for therapeutic stimulation of the central nervous system. { 'strik,nīn }

strychninization [MED] The condition resulting from large doses of strychnine. { ,strik·nə·nə'zā·shən }

Strychnos [BOT] A genus of tropical trees and shrubs of the order Loganiaceae. { 'strik,nōs }

Stuart factor [BIOCHEM] A procoagulant in normal plasma but deficient in the blood of patients with a hereditary bleeding disorder; may be closely related to prothrombin since both are formed in the liver by action of vitamin K. Also known as factor X; Stuart-Power factor. { 'stü·ərt ,fak·tər }

Stuart-Power factor *See* Stuart factor. { 'stü·ərt ¦pau̇·ər ,fak·tər }

Stuart windmill *See* Fales-Stuart windmill. { 'stü·ərt 'win,mil }

stub [CIV ENG] A projection on a sewer pipe that provides an opening to accept a connection to another pipe or house sewer. [COMPUT SCI] **1.** The left-hand portion of a decision table, consisting of a single column, and comprising the condition stub and the action stub. **2.** A program module that is only partly completed, to the extent needed to fulfill the requirements of other modules in the computer system. [ELECTROMAG] **1.** A short section of transmission line, open or shorted at the far end, connected in parallel with a transmission line to match the impedance of the line to that of an antenna or transmitter. **2.** A solid projection one-quarter-wavelength long, used as an insulating support in a waveguide or cavity. { stəb }

stub angle [ELECTROMAG] Right-angle elbow for a coaxial radio-frequency transmission line which has the inner conductor supported by a quarter-wave stub. { 'stəb ,aŋ·gəl }

stub axle [MECH ENG] An axle carrying only one wheel. { 'stəb ¦ak·səl }

stubborn disease [PL PATH] A virus disease of citrus trees characterized by short internodes resulting in stiff brushy growth and chlorotic leaves. { 'stəb·ərn di'zēz }

stub cable [ELEC] Short branch off a principal cable; the end is often sealed until it is used at a later date; pairs in the stub are referred to as stubbed-out pairs. { 'stəb ¦kā·bəl }

stub entry [MIN ENG] A short, narrow entry turned from another entry and driven into the solid coal, but not connected with other mine workings. { 'stəb ,en·trē }

stub matching [ELECTROMAG] Use of a stub to match a transmission line to an antenna or load; matching depends on the spacing between the two wires of the stub, the position of the shorting bar, and the point at which the transmission line is connected to the stub. { 'stəb ,mach·iŋ }

stub mortise [ENG] A mortise which passes through only part of a timber. { 'stəb ,mȯrd·əs }

Stubs gage [DES ENG] A number system for denoting the thickness of steel wire and drills. { 'stəbz ,gāj }

stub-supported coaxial [ELECTROMAG] Coaxial whose inner conductor is supported by means of short-circuited coaxial stubs. { 'stəb sə¦pȯrd·əd kō'ak·sē·əl }

stub-supported line [ELECTROMAG] A transmission line that is supported by short-circuited quarter-wave sections of coaxial line; a stub exactly a quarter-wavelength long acts as an insulator because it has infinite reactance. { 'stəb sə¦pȯrd·əd 'līn }

STRUT

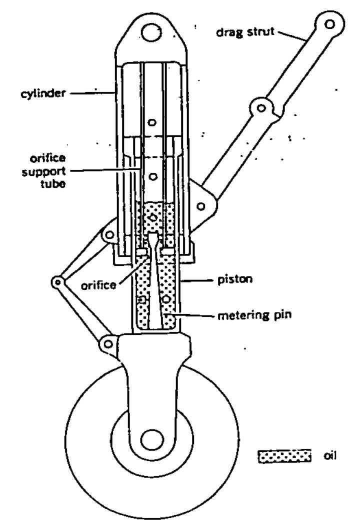
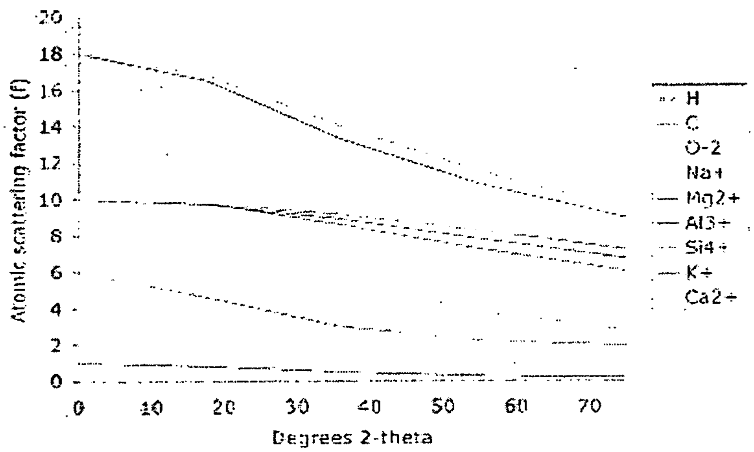


Diagram of oleopneumatic shock strut. As airplane sinks toward ground, piston forces oil through orifice, causing force which changes path of airplane.

APPENDIX B

As a consequence, f decreases with increasing angle of reflection. The figure below shows the change in f for commonly encountered ions in clay minerals. The values are plotted as a function to degrees two-theta. The plot below is for Cu Ka radiation. Click here for an Excel spreadsheet that allows you to change the wavelength of radiation (data from Cullity, 1978).



Scattering from a unit cell

Recall that rows of atoms cause scatter in specific directions resulting in constructive interference or coherent scatter.

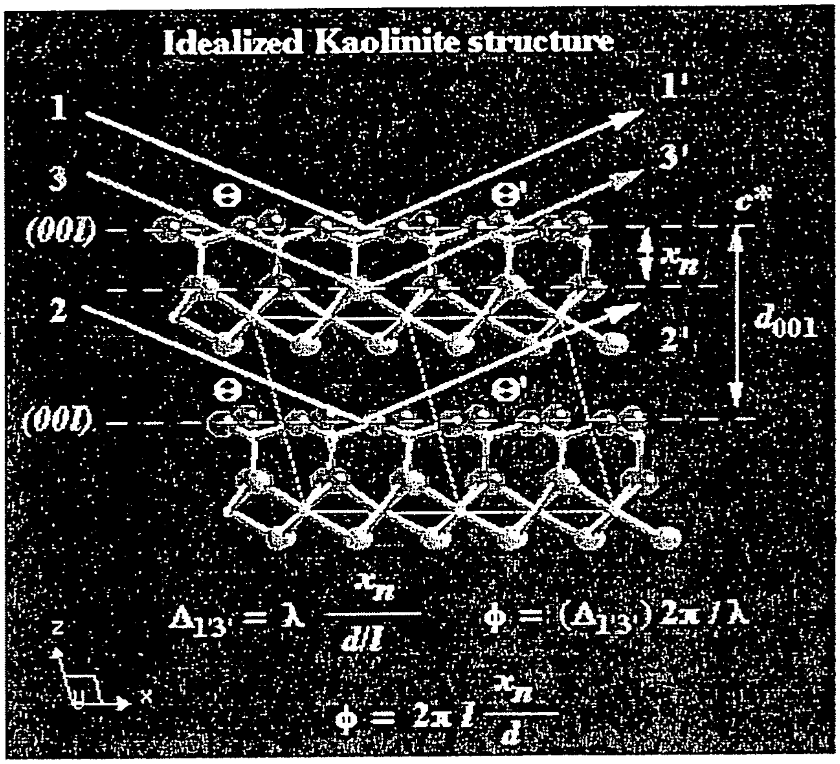
For the case of clay minerals, the approach is greatly simplified. The morphological nature of clay minerals is such that they can easily prepared to orient their crystallographic axes (the *ab* plane) relative to the X-ray beam. This is called "preferred orientation" (as opposed to random orientation).

We now want to describe this diffraction effect from a unit cell in a crystal. If the clays are oriented, then we can consider this to be a one-dimensional diffraction problem.

The scattering from a unit cell (F) is always less than the total sum of atoms in the unit cell because the rays that the atoms scatter are out of phase with each other. F is call the *structure factor* and is therefore, a measure of the intensity of the diffracted X-ray beam.

To find F, the sum of the amplitudes of each atom in the unit cell must be determined.

The sum of amplitudes must be adjusted by the amount of phase difference due to the location of the atoms in the unit cell. Recall that the phase difference is related to (1) the wavelength, (2) the angle of incidence, (3) the position of the atom planes and (4) the number and type of atoms in each plane. An example is given the figure below.



Phase shift ϕ can be expressed in more common crytallographic variables.

If d is the *c* lattice parameter, and x/c is the fractional coordinate *w* (recall also that (*uvw*) are the fractional coodinates for any position within a 3-D unit cell), then the phase shift expression becomes

$\phi = 2\pi l w$

For the 3-D case (i.e., (*hkl*))

$\phi = 2\pi(h u + k v + l w)$

Phase differences between the scattered waves (all with the same wavelength) can be determined mathematically by a structure factor function where:

$$F = \Sigma_n f_n \exp(i \phi_n) = f \exp(i \phi_1) + f \exp(i \phi_2) + \dots f \exp(i \phi_n)$$

where:

- F = amplitude or structure factor
- f = atomic scattering factor
- ϕ = phase angle
- i = sqrt(-1)
- n = atom type

We use the identity: